CHAPTER 7
GROUNDWATER

This chapter describes the groundwater resources in the study area and potential changes that could occur due to implementation of the alternatives. Groundwater could be affected due to changes in surface water elevations in the Salton Sea or excavation activities during construction.

STUDY AREA

The Salton Sea is located within the Colorado River Hydrologic Region, as defined by the Department of Water Resources (DWR, 2003). Seven groundwater basins in this hydrologic region are located adjacent to the Salton Sea, as listed below and shown in Figure 7-1:

- Imperial Valley Basin;
- Indio Subbasin of the Coachella Valley Basin; and
- Basins that do not include irrigated areas served by Imperial Irrigation District (IID) or Coachella Valley Water District (CVWD), including East Salton Sea Basin, Chocolate Valley Basin, Orocopia Valley Basin, West Salton Sea Basin, and Ocotillo-Clark Valley Basin.

REGULATORY REQUIREMENTS

The State regulates groundwater quality, however groundwater management is primarily carried out by local agencies. The Colorado River Basin Regional Water Quality Control Board (CRBRWQCB) Water Quality Control Plan defines municipal, industrial, and agricultural beneficial uses for groundwater resources in the Imperial and Coachella valleys (CRBRWQCB, 2002a). The Water Quality Control Plan includes the following goals and management principals for protection of groundwater:

- Preservation and enhancement of groundwater, fresh and saline, for present and anticipated beneficial uses, taking social and economic factors into consideration;

- Preservation of the groundwater basins for storing water for beneficial uses;

- Control of water quality factors that can be regulated to preserve the integrity of useable ground water basins; and

- Encourage groundwater recharge with water of adequate quality.

HISTORICAL PERSPECTIVE

The groundwater basins are characterized by thick layers of silt and clay deposited during historical flood events when lakes occurred in the Salton Basin, including Lake Cahuilla. The silt and clay layers are interspersed with coarse sand and gravel deposited in the basins as the waters in the lakes evaporated. The groundwater occurs in the sand and gravel deposits, or aquifers, between the silt and clay layers.

DATA SOURCES

Information regarding groundwater was obtained from published sources and previous planning documents.

DATA LIMITATIONS

Information regarding groundwater is based upon data compiled in previous studies from well logs and other groundwater analyses. Groundwater is used extensively in the Coachella Valley and substantial amounts of data are available. Use of groundwater is limited in the Imperial Valley due to high salinity and limited availability. Therefore, the amount of available groundwater data in the Imperial Valley is less than in the Coachella Valley.

EXISTING CONDITIONS

Characteristics of the seven groundwater basins located adjacent to the Salton Sea are described below.

Imperial Valley Basin

The Imperial Valley Basin is located south of the Salton Sea and is at the southernmost part of the Colorado Desert Hydrologic Region. The basin is bounded on the east by the Sand Hills and on the west by the impermeable rocks of the Fish Creek and Coyote Mountains. The basin extends from the Mexicali Valley to the Salton Sea (DWR, 2003). Imperial County is responsible for groundwater management in the Imperial Valley.

Deep exploration boreholes have shown that most of the Imperial Valley Basin is underlain by thick, water-saturated lacustrine and playa deposits overlying older sediments. Perched groundwater exists over much of the basin and is recharged by seepage from irrigated lands and drains (IID and Reclamation, 2002b). The basin has two major aquifers separated by a semi-permeable aquitard (silt and clay lenses) that averages 60 feet thick and reaches a maximum thickness of 280 feet. Average thickness of the upper aquifer is 200 feet with a maximum thickness of 450 feet. The lower aquifer averages 380 feet thick with a maximum thickness of 1,500 feet (DWR, 2003). Studies have indicated that the hydraulic connection is poor between the water within the deeper deposits and that within the upper part of the aquifer (IID and Reclamation, 2002b). Well yields in this area are limited (Loeltz et al., 1975).

The general direction of groundwater movement in the Imperial Valley Basin is from the Colorado River towards the Salton Sea. However, in the southern portion of the basin, a substantial amount of groundwater flows into the Alamo River and, to a lesser extent, the New River (USGS, 2004). Seepage from the All-American Canal and other canals has caused formation of localized perched groundwater. Between the early 1940s and 1960, groundwater levels rose more than 40 feet along the All-American Canal. Seepage from the canal is expected to decrease substantially when the canal is lined.

Tile drains have been installed by IID to convey shallow groundwater away from the root zone of crops (IID and Reclamation, 2002b). Most of the shallow groundwater, leaching water, or excess irrigation water flows into the drains and New and Alamo rivers. Groundwater levels remained relatively stable within the majority of the basin between 1970 and 1990 because of a constant rate of discharge from canals and subsurface agricultural drains (DWR, 2003).

The San Andreas and Algodones faults do not appear to impede or control groundwater movement, based on review of groundwater levels in the 1960s (Salton Sea Authority, 1999).

As described in Appendix H-2, Hely et al. (1966) estimated the groundwater discharge to the Salton Sea to be less than 2,000 acre-feet/year and IID and Reclamation (2002a) has estimated this value to be about 1,000 acre-feet/year. The IID estimate of 1,000 acre-feet/year has been adopted as a reasonable estimate of historical groundwater discharge to the Salton Sea from the Imperial Valley because it was developed in a method that was consistent with the hydrological assumptions used in the Draft Programmatic Environmental Impact Report (PEIR) and it represents a period of time after the groundwater elevation became stable in the 1970s.

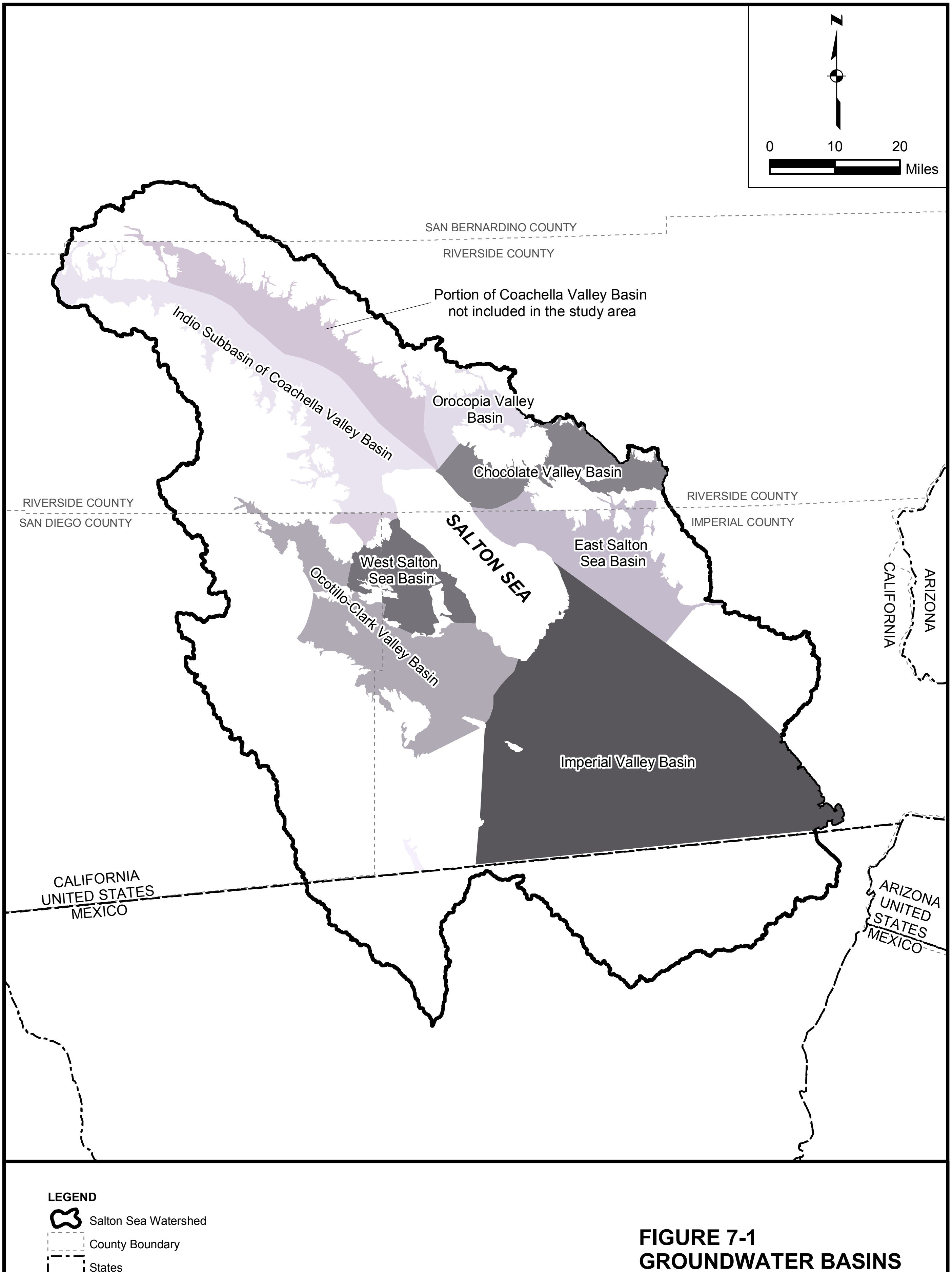

FIGURE 7-1
GROUNDWATER BASINS

SAC \\GLACIER\SACGIS\SALTON_SEA\GIS\MXDS\PEIR\FIGURE7_1_GW_BASINS2.MXD FIGURE7_1_GW_BASINS2.PDF 7/11/2006 13:41:27

Groundwater quality varies extensively in the Imperial Valley Basin. Total dissolved solids, a measure of salinity, ranged from 498 to 7,280 mg/L (DWR, 2003). High concentrations of fluoride have been reported (IID and Reclamation, 2002b).

Due to the low yield and poor water quality, few production wells have been drilled in the Imperial Valley. Most of the wells in the Imperial Valley are domestic wells. Total production from these wells is estimated to be a few thousand acre-feet/year (Salton Sea Authority, 1999).

Extremely deep groundwater has been developed along the southern Salton Sea shoreline for geothermal resources. These wells access non-potable groundwater from several thousand feet below ground surface.

Indio Subbasin of the Coachella Valley Basin

The portion of the Coachella Valley Basin adjacent to the Salton Sea is designated as the Indio subbasin by DWR (2003). The CVWD recently completed a water management plan that evaluated groundwater improvements in the Indio subbasin (CVWD, 2002a).

The aquifer is generally unconfined in the northern portions of the subbasin and confined in the areas near the Salton Sea. Therefore, groundwater recharge occurs to a greater extent in the northern portion of the subbasin (CVWD, 2002a). Groundwater near the Salton Sea occurs in a semi-perched aquifer, upper aquifer, and lower aquifer. Near the ground surface, the semi-perched aquifer consists of silt, clay, and fine sand lake deposits ranging in thickness from a few feet in the northern portion of the subbasin to about 100 feet near the Salton Sea. Below the semi-perched aquifer, the upper aquifer is 100 to 300 feet of permeable older alluvium consisting of silts and fine sands with clay. The upper aquifer has a higher percentage of clay closer to the Salton Sea. A clay and sandy clay aquitard (100 to 200 feet thick) separates the upper and lower aquifers. The lower aquifer is the principle water-bearing zone and groundwater source in the southern Coachella Valley. The lower aquifer consists of gravel, sand, silt, clay, and poorly consolidated sandstone deposits. This lower aquifer is over 1,000 feet thick. Seepage from the Indio subbasin historically provided substantial groundwater inflow into the Salton Sea until groundwater overdraft conditions occurred (Salton Sea Authority and Reclamation, 2000). The overdraft conditions cause water from the Salton Sea to flow into the Indio subbasin aquifers.

The CVWD operates over 80 municipal wells that range in depth from 900 to 1,300 feet and wells for agricultural uses (CVWD, 2002a). Currently, groundwater withdrawals primarily due to groundwater pumping, discharge to surface drains, phreatophyte consumptive use are greater than the recharge rate primarily due to return flows and artificial recharge. CVWD estimates that total groundwater basin storage has been reduced by 1,421,400 acre-feet since 1936. Groundwater discharge to the Salton Sea is estimated to be about 2,710 acre-feet/year in 1950, when groundwater conditions were higher, and have gradually been reduced to about -366 acre-feet/year (groundwater inflow) in 1999 when groundwater levels were lower (IID and Reclamation, 2002b and CVWD, 2002a).

Natural recharge is variable due to highly variable precipitation patterns, and has been estimated to range from 10,000 acre-feet/year in dry years to 187,000 acre-feet/year in extremely wet years (DWR, 2003). CVWD implemented a groundwater recharge program in 1973 and utilized over 1,700,000 acre-feet of Colorado River water between 1973 and 1999. Also, through an advance delivery agreement with the Metropolitan Water District of Southern California (Metropolitan), over 290,300 acre-feet of Colorado River water has been stored in a groundwater reservoir in the upper Coachella Valley basin located west of Palm Springs. In 1995, a pilot recharge program was initiated by CVWD to determine if groundwater recharge was possible in the lower Coachella Valley (generally from Indio to the Salton Sea). In 1998, CVWD determined that recharge was feasible and the project was expanded (CVWD, 2002a). Based upon the results of these projects, CVWD recommended groundwater recharge projects throughout the Coachella Valley to reduce or eliminate the overdraft and the associated saltwater intrusion from the Salton Sea.

Water quality has been impacted at several locations throughout the basin due to petroleum hydrocarbons, nitrates, and salts and has led to the abandonment of several drinking water wells in the Coachella Valley (CRBRWQCB, 2003). Near the Salton Sea, groundwater salinity has increased due to saltwater intrusion from the Salton Sea.

Subbasins in Areas Not Tributary to Irrigated Areas of Imperial Irrigation District and Coachella Valley Water District

The remaining basins in the Salton Sea watershed include the East Salton Sea, Chocolate Valley, Orocopia Valley, West Salton Sea, and Ocotillo-Clark Valley basins. Groundwater inflow to the Salton Sea from these areas was estimated by Hely et al (1966) and Loeltz et al. (1975) to be about 10,000 acre-feet/year, as described in Appendix H-2. The groundwater underflow entering the Salton Sea at the perimeter comes primarily from the alluvium underlying San Felipe Creek (Ocotillo-Clark Valley Basin).

East Salton Sea Basin

The East Salton Sea Basin is bordered on the north and east by the Chocolate Mountains and by the San Andreas Fault and the Salton Sea on the west. Groundwater movement is primarily in a western to southwestern direction towards the Salton Sea. Groundwater flow may be impeded by the faults (DWR, 2003). Groundwater flow from the East Salton Sea and Chocolate Valley basins (described below) represent about 16 percent of the groundwater inflow to the Salton Sea (Salton Sea Authority and Reclamation, 2000).

Water-bearing alluvium includes unconsolidated younger Quaternary alluvial deposits and the underlying unconsolidated/semi-consolidated older Tertiary to Quaternary alluvial deposits (DWR, 2003). Recharge is primarily from infiltration of runoff at the base of the Chocolate Mountains. Groundwater levels declined between 1963 and 2000. Due to limited availability and high salinity, groundwater is not used for domestic, municipal, or agricultural purposes in this basin.

Chocolate Valley Basin

The Chocolate Valley Basin is bounded by non-water-bearing rocks in the Orocopia and Chuckwalla mountains on the north and the Chocolate Mountains on the south and southeast. The eastern and western borders are formed by a drainage divide and the Salton Sea, respectively. Salt Creek conveys surface runoff through this basin to the Salton Sea (DWR, 2003). Springs and wetlands occur near Salt Creek. Artesian conditions occurred before the construction of the Coachella Canal (Salton Sea Authority, 1999).

Major water-bearing deposits include unconsolidated younger Quaternary alluvial deposits and the underlying unconsolidated to semi-consolidated older Tertiary to Quaternary alluvial deposits. Depth of the fill is at least 400 feet. The San Andreas Fault crosses the northern and western portions of the basin and may impede groundwater movement. Groundwater generally moves southwest beneath Salton Creek and discharges to the Salton Sea (DWR, 2003). Recharge to the basin is primarily from infiltration and runoff from adjacent mountains. Groundwater level monitoring has been inconsistent and has generally only occurred at the far western portion of the basin. Groundwater quality is characterized by high concentrations of fluoride, boron, and total dissolved solids. Due to limited availability and high salinity, groundwater is not used for domestic, municipal, or agricultural purposes in this basin.

Orocopia Valley Basin

This basin is located beneath the Orocopia Valley and is bounded by the Cottonwood and Eagle Mountains on the north, the Orocopia and Chocolate Mountains on the south, the San Andreas Fault zone and the Mecca Hills semi-permeable rocks on the west, and by a bedrock constriction on the east

(DWR, 2003). The southwestern boundary is located adjacent to the Salton Sea, however, this basin is not hydraulically connected to the Salton Sea.

Water-bearing alluvial and lake deposits are up to 4,400 feet thick. Groundwater conditions range from unconfined to confined in the western portion of the basin. Faults are located along the northern and southern boundaries of the basin (DWR, 2003). Natural recharge is limited and originates from the surrounding mountains. Groundwater levels in this basin range from 480 to 800 feet below the ground surface. Fluoride, color, radon, and uranium concentrations exceed drinking water standards in some wells. Due to limited availability and poor quality, groundwater is not used for domestic, municipal, or agricultural purposes in the western portion of this basin near the Salton Sea.

West Salton Sea Basin

The West Salton Sea Basin is bounded by the impermeable rocks of the southern Santa Rosa Mountains on the northwest and west, alluvial drainages on the north and south, and the Salton Sea on the east. Groundwater moves to the Salton Sea (DWR, 2003). Water-bearing units include the unconsolidated younger Quaternary alluvial deposits and the underlying semi-consolidated older Tertiary to Quaternary alluvial deposits. Fine-grained lacustrine deposits of the former Lake Cahuilla may impede seepage and lateral movement of groundwater in the east and southeast portion of the basin. Recharge is primarily from runoff through coarse-grained alluvial deposits at the base of the Santa Rosa Mountains. Limited available well data show that water levels declined about 64 feet between 1979 and 2000. Relatively high concentrations of fluoride, boron, and total dissolved solids limit use of the groundwater for domestic and irrigation uses.

Ocotillo-Clark Valley Basin

The Ocotillo-Clark Valley Basin is bounded by the Santa Rosa Mountains on the north and northeast, the Coyote Creek and Superstition Mountain faults on the west and south, and the Salton Sea on the east. The Ocotillo subbasin drains towards the Salton Sea and the Clark Valley subbasin drains toward the west (DWR, 2003). San Felipe Creek is located within the Ocotillo-Clark Valley Basin. Flows in the lower reaches of the San Felipe Creek are supplied by several hot springs (Salton Sea Authority, 1999).

The aquifer consists of alluvium underlain by non-water-bearing crystalline bedrock. Although the water-bearing deposits are not well defined in this basin, the deposits are likely to consist of Pliocene to Holocene stream, alluvial fan, lake, and eolian deposits that may be more than 1,800 feet thick (DWR, 2003). Near the Salton Sea, total dissolved solids are higher than 1,000 mg/L. The groundwater also contains high sulfate, chloride, and fluoride concentrations. Therefore, use of groundwater is limited in the basin near the Salton Sea.

ENVIRONMENTAL IMPACTS

Analysis Methodology

The groundwater analysis in the PEIR is based upon an understanding of projected groundwater elevation and quality changes in the No Action Alternative-CEQA Conditions and No Action Alternative-Variability Conditions based upon results of previously completed studies, as described below. Implementation actions for the PEIR alternatives were considered in a quantitative manner as part of the impact assessment.

Significance Criteria

The following significance criterion were based on CEQA and used to determine if changes as compared to Existing Conditions and the No Action Alternative would:

- Substantially deplete groundwater supplies or interfere with groundwater recharge that would cause a deficit in the aquifer volume or lower the local groundwater level.

An additional significance criterion was included in the PEIR based on CRBRWQCB requirements to not:

- Cause groundwater quality degradation.

Application of Significance Criteria

Significance criteria have been applied to the alternatives considered in the PEIR. The following list summarizes the overall methodology in the application of the criteria to the alternatives:

- **Substantially deplete groundwater supplies, interfere with groundwater recharge, or cause saltwater intrusion -** The alternatives would cause changes in water surface elevations of the Salton Sea that could affect groundwater elevation and movement in the surrounding basins; and

- **Cause groundwater quality degradation, not including saltwater intrusion -** Groundwater quality degradation due to saltwater intrusion is included in the previous significance criterion. Degradation also could be caused by spills of chemicals, fuels, and oils during construction and operations and maintenance.

Summary of Assumptions

The assumptions related to the descriptions of the alternatives are described in Chapter 3. The specific assumptions related to the analysis of groundwater resources are summarized in Table 7-1.

Table 7-1
Summary of Assumptions for Groundwater Resources

Assumptions Common to All Alternatives	
1) Assumptions described below.	
Assumptions Specific to the Alternatives	
No Action Alternative and Alternatives 1, 2, 3, 4, 5, 6, 7 and 8	No additional assumptions were made.

Summary of Impact Assessment

The impacts shown in Table 7-2 assume implementation of the Next Steps to reduce the adverse impacts.

No Action Alternative

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Pupfish Channels, and Salton Sea. The construction activities would be identical under the No Action Alternative-CEQA Conditions and the No Action Alternative-Variability Conditions. Therefore, construction impacts related to disturbance would be the same for both conditions. However, operational conditions would be different for the two scenarios.

Table 7-2
Summary of Benefit and Impact Assessments to Groundwater Resources

Alternative	Basis of Comparison	Changes by Phase I	II	III	IV	Comments	Next Steps
Criterion: Substantially deplete groundwater supplies, interfere with groundwater recharge, or cause saltwater intrusion.							
No Action Alternative	Existing Conditions	O	B	B	B	Saltwater intrusion would continue in the Indio Subbasin of the Coachella Valley Basin until the Salton Sea surface water elevation declined below -240 feet msl in Phase II.	None available.
	No Action Alternative	NA	NA	NA	NA		
Alternative 1	Existing Conditions	O	B	B	B	Similar to No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	O	O	O	O		
Alternatives 2 - 8	Existing Conditions	O	O	O	O	Saltwater intrusion would continue in the Indio Subbasin of the Coachella Valley Basin because the surface water elevation in the northern Sea Bed would be equal to or higher than the estimated groundwater aquifer elevation of -240 feet msl.	Determine if surface water elevation of water adjacent to the Coachella Valley Basin should be designed to reduce further saltwater intrusion. Saltwater intrusion would not occur in Phases II - III if CVWD water management plan is fully implemented.
	No Action Alternative	O	S	S	S		
Criterion: Cause groundwater quality degradation, not including saltwater intrusion.							
No Action Alternative	Existing Conditions	L	L	L	L	Potential for groundwater contamination due to spills of chemicals, fuels, or oils at construction site.	A Stormwater Pollution Prevention Plan would be prepared and implemented during construction and operations and maintenance.
	No Action Alternative	NA	NA	NA	NA		
Alternatives 1 - 8	Existing Conditions	L	L	L	L	Same as No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	L	L	L	L		

Legend for Types of Benefits or Impacts in Each Phase:
S = Significant Impact
O = No Impact
L = Less Than Significant
B = Beneficial Impact
NA = Not Analyzed

Groundwater is connected to the Salton Sea water except in the Orocopia Valley Basin, as described above. Groundwater elevations are higher than the existing Salton Sea surface water elevation in all of the groundwater basins except the Indio subbasin of the Coachella Valley Basin (DWR, 2003). Therefore, as the Salton Sea surface water elevation declines under the No Action Alternative, groundwater in the Orocopia Valley Basin would not be impacted and groundwater would continue to flow into the Salton Sea from the other basins except for the Coachella Valley Basin.

In the Indio Subbasin of the Coachella Valley Basin, saltwater intrusion would continue until the Salton Sea water surface elevation becomes lower than the groundwater aquifer elevation. Under the No Action Alternative-CEQA Conditions, it is anticipated that CVWD would initiate the water management plan, as described in Chapter 3, and that the groundwater aquifer elevation would increase to -240 feet msl by 2015 and -180 feet msl by 2035 (CVWD, 2002a). Under the No Action Alternative-CEQA Conditions, the Salton Sea water surface elevation would be -234 feet msl by 2015 and -248 feet msl by 2035. Therefore, in 2015 (Phase I of the No Action Alternative), saltwater intrusion would continue because the Salton Sea surface water elevation would be higher than the groundwater aquifer elevation. However, by 2035 (Phase III of the No Action Alternative), the groundwater aquifer elevation would be substantially higher than the Salton Sea surface water elevation, and the saltwater intrusion would not occur, which would improve groundwater conditions in this subbasin. It is estimated that this condition would start during Phase II.

Under the No Action Alternative-Variability Conditions, it is assumed that implementation of a portion of the measures in the CVWD water management plan would be delayed, and, therefore, the groundwater aquifer elevations would not rise as projected under the No Action Alternative-CEQA Conditions. Because many of the initial measures are being implemented currently, it is assumed that the groundwater would rise at least to elevations projected for 2015, -240 feet msl. For the purposes of the PEIR, the groundwater aquifer elevation under the No Action Alternative-Variability Conditions was assumed to be -240 feet msl for Phases I through IV. Therefore, saltwater intrusion would continue until the Salton Sea surface water elevation declined below -240 feet msl. This is estimated to occur by 2020 under the No Action Alternative-Variability Conditions. Therefore, saltwater intrusion would not occur in Phases II through IV.

Groundwater contamination could occur in all basins if chemicals, fuel, or oil were spilled during construction and operations and maintenance activities.

Alternative 1 – Saline Habitat Complex I

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Pupfish Channels, Saline Habitat Complex, and Brine Sink.

As described under the No Action Alternative, the only groundwater basin that would be affected by changes in surface water elevations in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. As described in Chapter 3, all of the PEIR alternatives have been developed based upon inflow assumptions described under the No Action Alternative-Variability Conditions. Therefore, groundwater conditions under all of the PEIR alternatives also have been analyzed based upon the same assumptions, including partial implementation of the CVWD water management plan within the study period, as described above under the No Action Alternative-Variability Conditions.

Under Alternative 1, the closest surface water in the Sea Bed near the Indio Subbasin of the Coachella Valley Basin would be the Brine Sink. As described in Chapter 3, the Brine Sink surface water elevation would be at -241 feet msl by 2020 and would continue to decline. Saltwater intrusion would occur until the Brine Sink surface water elevation was lower than -240 feet msl toward the end of Phase I. Saltwater intrusion would not occur in Phases II through IV because the Brine Sink surface water elevation would be lower than -240 feet msl. Therefore, groundwater conditions would be similar to those described under the No Action Alternative.

Groundwater contamination could occur during construction and operations and maintenance activities as described under the No Action Alternative.

Alternative 2 – Saline Habitat Complex II

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 2, the closest surface water in the Sea Bed near this subbasin would be the Saline Habitat Complex with a surface water elevation of -230 feet msl. Saltwater intrusion would continue to occur throughout the entire study period because the surface water elevation in the Saline Habitat Complex would be higher than the projected groundwater elevation of -240 feet msl. It should be noted that if CVWD is able to fully implement the water management plan, groundwater aquifer elevations would be higher than the Saline Habitat Complex during Phase II and saltwater intrusion would not occur.

Groundwater contamination could occur during construction and operations and maintenance activities as described under the No Action Alternative.

Alternative 3 – Concentric Rings

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, First and Second rings, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 3, the closest surface water in the Sea Bed near this subbasin would be the First Ring with a surface water elevation of -230 feet msl. Therefore, groundwater conditions under Alternative 3 would be similar to those described under Alternative 2.

Alternative 4 – Concentric Lakes

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins; First, Second, Third, and Fourth lakes; and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 4, the closest surface water in the Sea Bed near this subbasin would be the Second Lake with a surface water elevation of -240 feet msl. Saltwater intrusion would continue to occur. However, the extent of the saltwater intrusion would be less than under Existing Conditions because the surface water elevation would be the same as the projected groundwater elevation of -240 feet msl. It should be noted that if CVWD is able to fully implement the water management plan, groundwater aquifer elevations would be higher than the Second Lake during Phase II and saltwater intrusion would not occur.

Groundwater contamination could occur during construction and operations and maintenance activities as described under the No Action Alternative.

Alternative 5 – North Sea

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, Marine Sea, Marine Sea Recirculation Canal, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 5, the closest surface water in the Sea Bed near this subbasin would be the Marine Sea with a surface water elevation of -230 feet msl. Therefore, groundwater conditions under Alternative 5 would be similar to those described under Alternative 2.

Alternative 6 – North Sea Combined

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basin, Air Quality Management, Pupfish Channels, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, Marine Sea, Marine Sea Mixing Zone, Marine Sea Recirculation Canal, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 6, the closest surface water in the Sea Bed near this subbasin would be the Marine Sea with a surface water elevation of -230 feet msl. Therefore, groundwater conditions under Alternative 6 would be similar to those described under Alternative 2.

Alternative 7 – Combined North and South Lakes

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basin, Air Quality Management using Protective Salt Flat on Exposed Playa below -255 feet msl, Exposed Playa without Air Quality Management above -255 feet msl, Saline Habitat Complex, Recreational Saltwater Lake, Recreational Estuary Lake, Marine Sea Recirculation Canal, IID Freshwater Reservoir, two Treatment Plants, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 7, the closest surface water in the Sea Bed near this subbasin would be the Recreational Saltwater Lake with a surface water elevation of -230 feet msl. Therefore, groundwater conditions under Alternative 7 would be similar to those described under Alternative 2.

Alternative 8 – South Sea Combined

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Marine Sea, Marine Sea Recirculation Canal, and Brine Sink.

As described under Alternative 1, the only groundwater basin that would be affected by changes in surface water in the Sea Bed would be the Indio Subbasin of the Coachella Valley Basin. Under Alternative 8, the closest surface water in the Sea Bed near this subbasin would be the Marine Sea with a surface water elevation of -230 feet msl. Therefore, groundwater conditions under Alternative 8 would be similar to those described under Alternative 2.

Next Steps

During project-level analyses, monitoring information from the CVWD water management plan could be used to determine the rate at which the groundwater aquifer elevation was rising, and if the design criteria for the surface water elevation of water adjacent to the Indio Subbasin of the Coachella Valley Basin should be designed to reduce further saltwater intrusion.

To protect groundwater from contamination during construction and operations and maintenance activities, a Stormwater Pollution Prevention Plan would be prepared during project-level analyses. The plan would include measures to avoid spills and provisions for cleanup of spills to avoid future contamination for activities during construction and operations and maintenance.